μA722
10-BIT CURRENT SOURCE
FAIRCHILD LINEAR INTEGRATED CIRCUITS

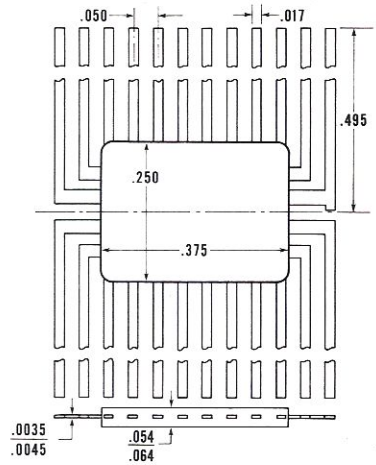
- **8 ± ½ BIT ACCURACY FROM 0°C TO +55°C**
- **7±½ BIT ACCURACY FROM −20°C TO +85°C**
- **600 ns SWITCHING SPEED**
- **INTERNAL PRECISION REFERENCE**
- **CCSL COMPATIBLE**

GENERAL DESCRIPTION — The μA722 is a high-speed, 10-bit precision current source intended for use in current-summing digital-to-analog converters or as the feedback element in successive approximation analog-to-digital converters. It is constructed on a single silicon chip, using the Fairchild Planar* epitaxial process, and consists of a reference supply, 10 current sources connected to a single output summing line, and associated logic switches. The full-scale current and coding format are set by an external resistor array, which may be preselected and fixed for general usage or trimmed for greater accuracy. The μA722 is compatible with the Fairchild families of linear and digital circuits.

ABSOLUTE MAXIMUM RATINGS

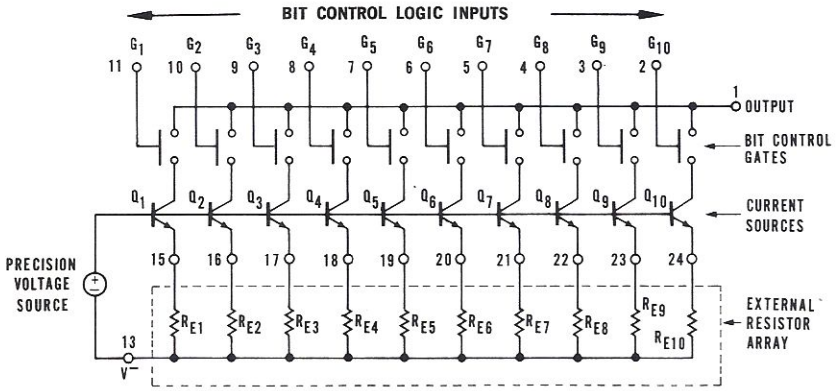
Voltage from V^+ to V^-	−0.5 V to +18 V
Voltage from Output to V^+	−12 V to +6 V
Voltage from Output to V^-	0 V to +12 V
Voltage from Logic Inputs to Output	−9 V to +7 V
Voltage from Logic Inputs to V^+	−18 V to 0 V
Voltage from Logic Inputs to V^-	0 V to +12 V
Internal Power Dissipation (Note 1)	450 mW
Operating Temperature Range	−20°C to +85°C
Storage Temperature Range	−65°C to +150°C
Lead Temperature (Soldering, 60 sec)	300°C

PHYSICAL DIMENSIONS
(TYPICAL FLAT PACKAGE)
(TOP VIEW)

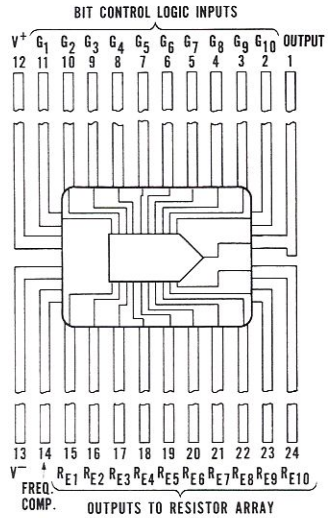


ORDER PART NO. U3M7722333

EQUIVALENT CIRCUIT


BIT CONTROL LOGIC INPUTS
G1 G2 G3 G4 G5 G6 G7 G8 G9 G10
11 10 9 8 7 6 5 4 3 2
1
OUTPUT
BIT CONTROL GATES
Q1 Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q9 Q10
CURRENT SOURCES
PRECISION VOLTAGE SOURCE
15 16 17 18 19 20 21 22 23 24
RE1 RE2 RE3 RE4 RE5 RE6 RE7 RE8 RE9 RE10
EXTERNAL RESISTOR ARRAY
13
V−

CONNECTION DIAGRAM
(TOP VIEW)


BIT CONTROL LOGIC INPUTS
V+ G1 G2 G3 G4 G5 G6 G7 G8 G9 G10 OUTPUT
12 11 10 9 8 7 6 5 4 3 2 1
13 14 15 16 17 18 19 20 21 22 23 24
V− FREQ. COMP. RE1 RE2 RE3 RE4 RE5 RE6 RE7 RE8 RE9 RE10
OUTPUTS TO RESISTOR ARRAY

NOTE: PIN 13 INTERNALLY CONNECTED TO CASE.

Notes on Page 2

*Planar is a patented Fairchild process.

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ELECTRICAL CHARACTERISTICS

PARAMETER (See Definitions)	CONDITIONS (Note 2)	MIN.	TYP.	MAX.	UNITS
Resolution				10	Bits
Absolute Error	$T_A = 25°C$		±.07	±.20	%
	$0°C \leq T_A \leq +55°C$		±.10	±.20	%
	$-20°C \leq T_A \leq +85°C$		±.13	±.39	%
Output Current					
Full-Scale	Logic Inputs = 0.4 V	2160	2560	3000	μA
Zero-Scale	Logic Inputs = 2.5 V		±.002	±.25	μA
Power Supply Rejection	$\Delta V^1 = \Delta V = \pm 5\%$		±.06	±0.1	%/%
Output Resistance		0.2	1.2		MΩ
Switching Speed			600		ns
Logic Input High Voltage		2.1	2.5		V
Logic Input Low Voltage			0.4	0.7	V
Power Consumption			165	250	mW

NOTES:

(1) Rating applies for ambient temperatures to +85°C.
(2) Unless otherwise specified, $T_A = 25°C$, $V^1 = 6.0$ V ±.01 V, V = −6.0 V ±.01 V, $V_{out} = 0$ V, $C_I = 200$ pF, and external resistor array as per Table 1.
(3) In Table 1, the maximum absolute value tolerance for $R_{E1} = \pm 10\%$.

TYPICAL FULL-SCALE OUTPUT CURRENT AS A FUNCTION OF AMBIENT TEMPERATURE

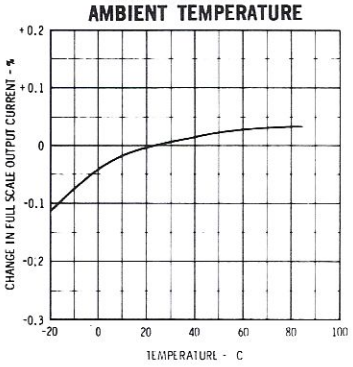
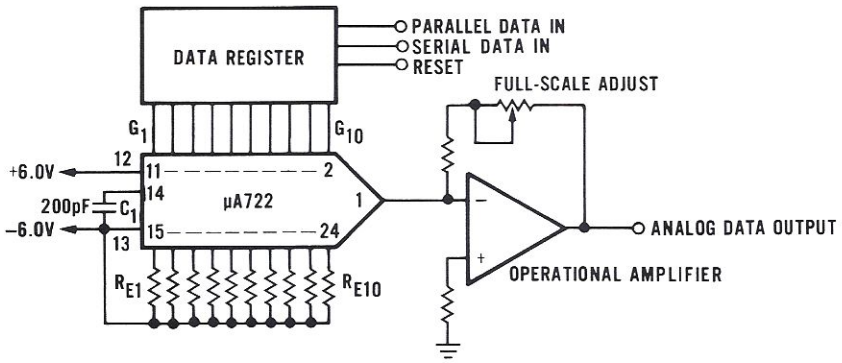


TABLE 1

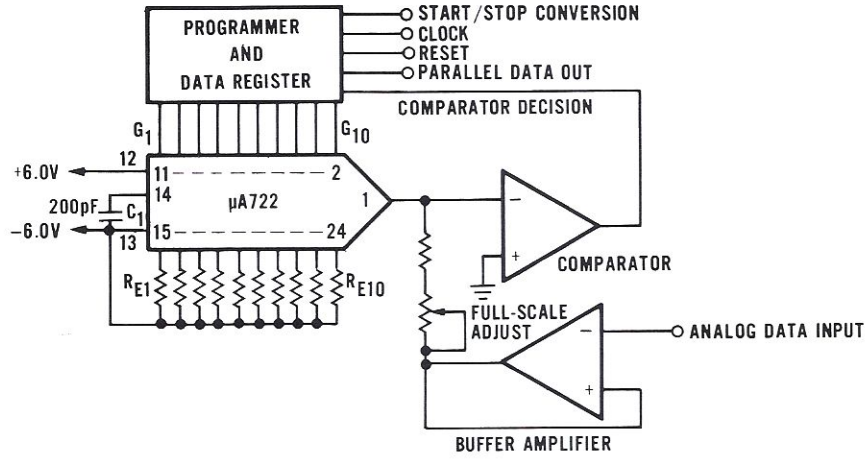
BINARY CODE RESISTOR ARRAY FOR 8 ± ½ BIT ACCURACY

Resistor Number (R_{EJ})	Nominal Value (kΩ)	Nominal Ratio (R_{EJ}/R_{E1})	Max. Ratio Tolerance ($T_A = 25°C$) (%)	Max. Ratio Temp. Coeff. (ppm/°C)
R_{E1}	2.547	1.000	Note 3	±5
R_{E2}	5.094	2.000	±0.02	±5
R_{E3}	10.245	4.022	±0.05	±10
R_{E4}	20.60	8.088	±0.10	±20
R_{E5}	41.43	16.265	±0.20	±20
R_{E6}	81.93	32.17	±0.20	±50
R_{E7}	163.4	64.16	±0.50	±100
R_{E8}	325.7	127.9	±1.0	±200
R_{E9}	644.9	253.2	±2.0	±500
R_{E10}	1275	500.8	±2.0	±500

TYPICAL DIGITAL-TO-ANALOG CONVERTER



TYPICAL ANALOG-TO-DIGITAL CONVERTER



DEFINITION OF TERMS

FULL SCALE OUTPUT CURRENT — The output current for all bits turned on.

ZERO SCALE OUTPUT CURRENT — The output current for all bits turned off.

ABSOLUTE ERROR — The worst-case deviation from a straight line drawn through zero and the 25°C value of the full-scale output current.

POWER SUPPLY REJECTION — The ratio of the percentage change in full-scale output current to the percentage change in supply voltage producing it.

OUTPUT RESISTANCE — The resistance seen looking into the output terminal with the output at virtual ground and all bits turned on.

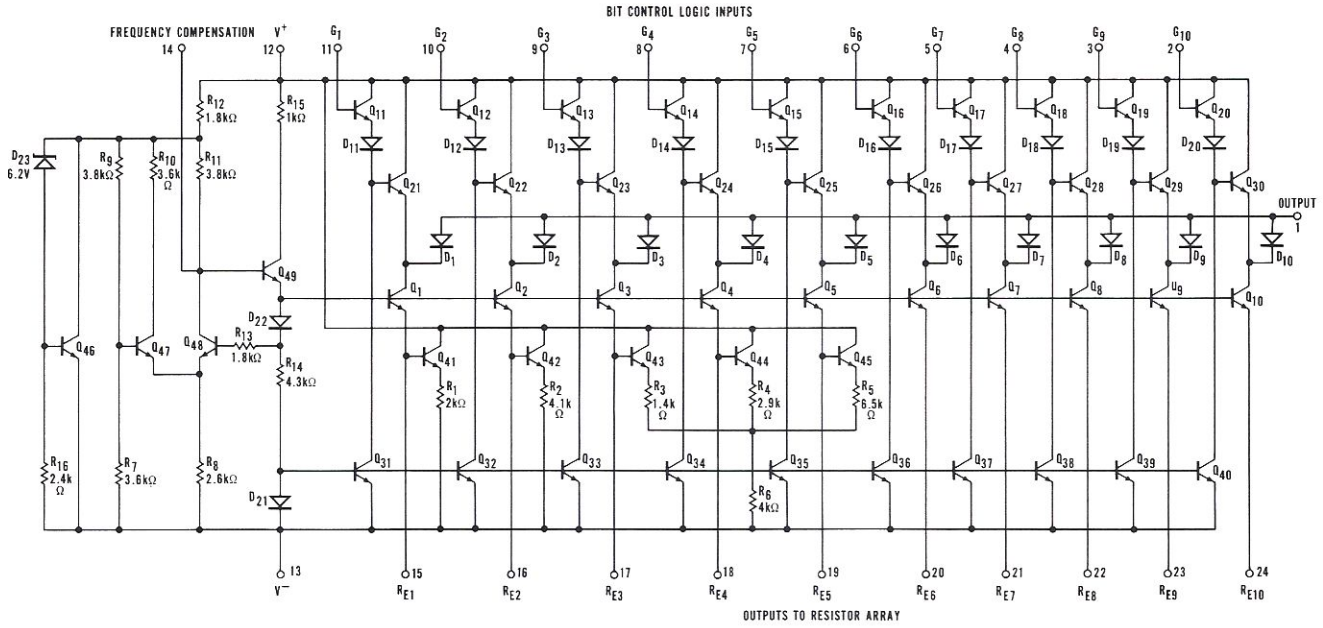
SWITCHING SPEED — The time required to turn on the least significant bit.

LOGIC INPUT HIGH VOLTAGE — The minimum voltage allowed at a bit control gate to hold the bit off.

LOGIC INPUT LOW VOLTAGE — The maximum voltage allowed at a bit control gate to hold the bit on.

POWER CONSUMPTION — The DC power required to operate the device; the power will vary with logic condition, but is specified as a maximum for the entire range of signal conditions.

SCHEMATIC DIAGRAM



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